B. NUMBER OPERATIONS AND RELATIONSHIPS

***Content Standard*: Students in Wisconsin will use numbers effectively for various purposes, such as counting, measuring, estimating, and problem solving.**

Rationale: People use numbers to quantify, describe, and label things in the world around them. It is important to know the many uses of numbers and various ways of representing them. Number sense is matter of necessity, not only in one's occupation but also in the conduct of daily life, such as shopping, cooking, planning a budget, or analyzing information reported in the media. When computing, an educated person needs to know which operations (for example, addition, multiplication), which procedures (for example, mental techniques, algorithms), or which technological aids (for example, calculator, spreadsheet) are appropriate.

***Performance Standards*: By the end of grade four, students will:**	***Sample Alternate Performance Indicators:* (1-3 per standard)**	***Sample Performance Activities/Tasks:* (1-2 per indicator)**	***Sources of Data***
B.4.1. Represent and explain whole numbers, decimals, and fractions with[2] • physical materials • number lines and other pictorial models • verbal descriptions • place-value concepts and notation • symbolic renaming (for example, 43 = 40+3 = 30+13)	1. Show how whole numbers, decimals, and fractions work with manipulatives, pictures, and oral sharing[2]	1.a. Solve problems of the following type(3) • Juan and his three friends ordered two large pizzas. Each will get an equal amount. • How much does each one get? • Draw a picture to show your answer. • They purchase pizza for $10. How much does each one have to pay? • Sombat has 8 quarters, 7 dimes, and 6 nickels. Does he have enough money? • How much more does he need, or how much extra does he have? • After the order, two more friends came. How much does each pay now? Problem may be read to student in L_1 or L_2. Problem may be taped	
B.4.2 Determine the number of things in a set by • grouping and counting (e.g., by threes, fives, hundreds) • combining and arranging	1. Demonstrate knowledge of sets[2]	1.a. Solve problems of the following type: A family of eight orders a large pizza, and each member gets one piece of pizza. How many cuts do you need to make if one cut gives two equal pieces, two cuts give four equal pieces, etc.? Use models or manipulative to demonstrate(3)	

(e.g., all possible coin combinations amounting to thirty cents) • estimation, including rounding		1.b. Solve problems of the following type: Determine the number of quarters, dimes, nickels, and/or pennies needed to make $0.50 and $0.75 using only five coins.(2)	
B.4.3. Read, write, and order whole numbers, simple fractions (e.g., halves, fourths, tenths, unit fractions), and commonly used decimals (monetary units)[2]	1. Identify, verbally and in writing, whole numbers, fractions, and decimals[2]	1.a. Solve problems of the following type: Express in mathematical symbols: one dollar and twenty-five cents(1) 1.b. Solve problems of the following type: How much is a fourth of a dollar(1) 1.c. Write equivalent fractions. Demonstrate fractions with the use of manipulative(2)	
B.4.4. Identify and represent equivalent fractions for halves, fourths, eighths, tenths, sixteenths[1]	1. Express fractions for halves, fourths, eighths, tenths, and sixteenths[1]	1.a. Draw a half, a fourth, and an eighth of a pizza(1) 1.b. Demonstrate 1/2 = 2/4 = 4/8 = 8/16 by using a circle graph or a computer(2) 1.c. Use manipulative and match to fractions (1/4, 2/3, ...)(1)	
B.4.5. In problem-solving situations involving whole numbers, select and efficiently use appropriate computational procedures such as[2] • recalling the basic facts of addition, subtraction, multiplication, and division • using mental math (e.g., 37+25, 40x7) • estimation • selecting and applying algorithms for addition, subtraction, multiplication, and division • using calculator	1. Demonstrate the basic facts of addition, subtraction, multiplication, and division[1]	1.a. List a family monthly income and expenses and use a calculator to do the following:(2) • add the incomes and expenses • subtract the total expense from the total income. How much do you have left for savings? Problem may be read to student in L_1 or L_2. Problem may be taped 1.b. Make a projected three-month statement showing a family's income and expenses(3)	

B.4.6. Add and subtract fractions with like denominators[1]	1. Distinguish between a numerator and a denominator[1] 2. Add and subtract a numerator[1] 3. Identify fractions with like denominators [1]	1.a. Circle numerators and underline denominators(1) 2.a. Add (1/4 + 3/4 =____)(1) 2.b. Subtract (5/6 - 1/6 = ___)(1) 3.a. Compare fractions with like denominators (e.g., 1/3 < 2/3) (1)	
B.4.7. In problem-solving situations involving money, add and subtract decimals[2]	1. Explain problem-solving situations involving adding and subtracting monetary decimals [2]	1.a. Solve problems of the following type: Your family is selling vegetables. On Wednesday you earned $102.55. On Saturday you earned $176.19. How much did your family earn in all? How much more did your family earn on Saturday than on Wednesday?(2)	
***Performance Standards*: By the end of grade eight, students will:**	***Sample Alternate Performance Indicators:* (1-3 per standard)**	***Sample Performance Activities/Tasks:* (1-2 per indicator)**	***Sources of Data***
B.8.1. Read, represent, and interpret various rational numbers (whole numbers, integers, decimals, fractions, and percents) with verbal descriptions, geometric models, and mathematical notation (e.g., expanded, scientific, exponential)[2]	1. Understand and interpret various types of numbers and their operations[2]	1.a. Keep a mathematical journal of terms with graphics and examples to illustrate the definitions. Use L_1 or L_2 (2)	
B.8.2. Perform and explain operations on rational numbers (add, subtract, multiply, divide, raise to a power, extract a root, take opposites and reciprocals, determine absolute value)[2]	1. Explain operations on rational numbers[2]	1.a. Keep a mathematical journal of terms with graphics and examples to illustrate the definitions. Use L_1 or L_2. (2)	

B.8.3. Generate and explain equivalencies among fractions, decimals, and percents[2]	1. Identify, verbally and in writing, equivalencies among fractions, decimals, and percents[1]	1.a. Understand the relationships of various numbers such as 1/2 = 50% = 0.5; 1/3 >, or <, or = 0.25; 1/3 = ____ = ____ %(1)	
B.8.4. Express order relationships among rational numbers using appropriate symbols (>, <, =, =, ?)[2]	1. Show relationships among rational numbers and symbols[2]	1.a. Understand the relationships of various numbers such as 1/2 = 50% = 0.5; 1/3 >, or <, or = .25; 1/3 = .___ = _____%(1)	
B.8.5. Apply proportional thinking in a variety of problem situations that include, but are not limited to • ratios and proportions (e.g., rates, scale drawings, similarity • percents, including those greater than 100 and less than one (e.g., discounts, rate of increase or decrease, sales tax)[3]	1. Display knowledge of problem solving in realistic situations for ratios and percents[2]	1.a. Solve problems of the following type: Kia is shopping for a blouse. The one she wants is normally $14.99 but on sale at 30% off. What would be her final cost including 5.5% sales tax?(2)	
B.8.6. Model and solve problems involving number-theory concepts such as [3] • prime and composite numbers • divisibility and remainders • greatest common factors • least common multiples	1. Display knowledge of problem solving in realistic situations for ratios and percents[2]	1.a. Identify which of the following numbers are prime, which are composite, and why? 9, 10, 11, 12 (2) 1.b. Identify the greatest common factor and least common multiple of the following pairs of numbers: (a) 5, 9; (b) 6,8; (c) 10, 20 (1)	
B.8.7. In problem-solving situations, select and use appropriate computational procedures with rational numbers such as	1. Use calculators and computer spreadsheets in problem solving[2]	1.a. Use scientific calculators and computer spreadsheets to show changes in racial/ethnic composition in the student's community. Begin by looking for census data at the local library or city hall(3)	

• calculating mentally • estimating • creating, using, and explaining algorithms[2]			
***Performance Standards*: By the end of grade twelve, students will:**	***Sample Alternate Performance Indicators:* (1-3 per standard)**	***Sample Performance Activities/Tasks:* (1-2 per indicator)**	***Sources of Data***
B.12.1. Use complex counting procedures such as union and intersection of sets and arrangements (permutations and combinations) to solve problems	1. Discuss unions, sets, and arrangements to solve problems	1.a. Create a Venn diagram to indicate the places of birth of the students in the class: Place/Wisconsin/Midwest/United States/world. Discuss the union and intersection of these sets	
B.12.2. Compare real numbers using • order relations (>, <) and transitivity • ordinal scales including logarithmic (e.g., Richter, pH rating) • arithmetic differences • ratios, proportions, percents, rates of change	1. Discuss unions, sets, and arrangements to solve problems	1.a. Solve problems of the following type: In your class, the students have the following eye colors: blue eyes = 4 students; green eyes = 3 students; brown eyes = 5 students; gray eyes = 2 students. What percentage of the class have green eyes? What percentage of the students do not have brown eyes? 1.b. Solve problems of the following type: 3/14 = 5/16, True or False? Explain	
B.12.3. Perform and explain operations on real numbers (add, subtract, multiply, divide, raise to a power, extract a root, take opposites and reciprocals, determine absolute value)	1. Perform and explain operations on real numbers	1.a. Solve problems of the type for B.12.2.-1.a.	
B.12.4. In problem-solving situations involving the application of different number systems (natural, integers,	1. In problem-solving situations involving the application of different number systems (natural, integers, rational, real), select and use	1.a. Solve problems of the following type: On Monday, January 7, the temperature in Madison, Wisconsin was -20° F. On Monday, January 14, the temperature was 30° F. What was the difference, and what was the average daily rate of change	

rational, real), select and use appropriate • computational procedures • properties (e.g., commutativity, associativity, inverses) • modes of representation (e.g., rationals as repeating decimals and indicated roots as fractional exponents)	appropriate • computational procedures • properties (e.g., commutativity, associativity, and inverses) • modes of representation (e.g., rationals as repeating decimals and indicated roots as fractional exponents	of the temperature?	
B.12.5. Create and critically evaluate numerical arguments presented in a variety of classroom and real-world situations (e.g., political, economic, scientific, social)	1. Create and critically evaluate numerical arguments presented in a variety of classroom and real-world situations (e.g., political, economic, scientific, social)	1.a. Solve problems of the following type: Sam has $50 to spend. If t-shirts sell for $14 and a pair of pants for $20, how can Sam spend his money to get the most articles of clothing?	
B.12.6. Routinely assess the acceptable limits of error when • evaluating strategies • testing the reasonableness of results • using technology to carry out computations	1. Routinely assess the acceptable limits of error when • evaluating strategies • testing the reasonableness of results • using technology to carry out computations	1.a. Graph the above information (B.12.5; 1.a.) showing Sam's remaining amount of money	